

MINUTES

CALIFORNIA TRAFFIC CONTROL DEVICES COMMITTEE MEETING OF SEPTEMBER 21, 1995

The third meeting of the CTCDC in 1995 was held in the Caltrans District 4 Office Auditorium, at 111 Grand Avenue, in the city of Oakland, on Thursday, September 21, 1995.

Chairman Dick Folkers opened the meeting at 9:03 a.m. with the introduction of members and guests. The Chairman thanked Caltrans District 4 on behalf of the Committee.

The following members, alternates, and guests were in attendance:

ATTENDEES	ORGANIZATION	TELEPHONE
Members (Voting)		
Dick Folkers Chairman	League of California Cities, City of Palm Desert	(619) 346-0611
Wayne Tanda Vice Chairman	League of California Cities, City of San Jose	(408) 277-4945
Merry Banks	California State Automobile Association, San Fransico	(415) 565-2297
Bruce Carter	County Supervisors Association of California, Shasta County	(916) 225-5661
Capt. Don Follett	California Highway Patrol, Sacramento	(916) 657-7222
Gary Foxen	Auto Club of Southern California, Los Angeles	(213) 741-4429
Jack Kletzman	California Department of Transportation, Sacramento	(916) 654-4715
John Wallo	County Supervisors Association of California, San Luis Obispo County	(805) 781-4466
Jack Kletzman Secretary	California Department of Transportation, Sacramento	(916) 654-4715

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ATTENDEES	ORGANIZATION	TELEPHONE
Jose Ampon	City of Salinas	(408) 758-7439
Gene Benton	City of Santa Rosa	(707) 543-3815
Rick Blunden	Caltrans, Sacramento	(916) 653-0036
Bob Brow	Sacramento County	(916) 366- 2227
Bruce Crater	Inland Safety	(909) 220-1756
David Evans	Hewlett-Packard	(408) 435-6144
Hal Garfield	Consultant	(916) 487-2869
Frank Girardot	Synchronex	(408) 275-8392
Michael Harrison	Light Guard Systems	(707) 838-0745
Phil Jang	Caltrans, Sacramento	(916) 654-7138
W. E. Johnson	Econolite	(714) 630-3700
Alex Kennedy	Caltrans, Sacramento	(916) 654-2634
Dwight Ku	California State Automobile Association, Sacramento	(916) 443-2577
Les Kubel	Caltrans, Sacramento	(916) 654-4949
Christian Lackner	Bicycle Mass	(415) 776-7653
C. K. Lau	Caltrans, Oakland	(510) 286-4555
Ken Logan	Office of Traffic Safety	(916) 445-9734
Lujuanna Lopez	CHP, Sacramento	((916) 657-7222
Mansour Malek	City of San Jose	(408) 277-2533
Jerry McElroy	Caltrans, Fresno	(209) 488-4174
Hank Mohle	City of Murrieta	(909) 698-1040 x242
Carl Negele	City of Danville	(510) 820-1080

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ATTENDEES	ORGANIZATION	TELEPHONE
Virendra Patel	City of Alameda	(510) 748-4514
Robert Peterson	Caltrans, Sacramento	(916) 654-2697
Rafiat Raie	City of Walnut Creek	(510) 256-3527
Chris Ramstead	Los Angeles County	(818) 458-5908
Sal Rosano	City of Santa Rosa	(707) 543-3559
Dave Royer	City of Los Angeles	(213) 485-3548
Mohammad Siddiqui	Stanislaus County	(209) 525-6552
Charles Smith	No affiliation	(510) 525-4434
J. D. Stokes	FHWA, Sacramento	(916) 498-5868
Clyde Sweet	City of Fontana	(909) 350-6600
Tadesse Teferi	Caltrans, Los Angeles	(213) 897-0266
Jerry Tripp	Caltrans, Fresno	(209) 488-4194
Ed von Borstel	City of Modesto	(209) 577-5266
Stan Workman	Foster City	(415) 286-3285
Robert Zeigler	Marin County	(415) 499-6336

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MEMBERSHIP

Mr. Hal Rosenberg, serving on behalf of the League of California Cities, has announced his retirement from the City of Chula Vista. Ms. Merry Banks will replace Mr. Russ Taft on the Committee and Mr. Dwight Ku has been appointed as the alternate representative for the California State Automobile Association.

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MOTION: By Gary Foxen, second by Bruce Carter, to adopt the minutes of the Costa Mesa meeting held on May 4, 1995. Motion carried 7-0.

92-4B L. E. D. STUDY, CITY OF SAN JOSE

Jim Helmer, with the City of San Jose, recalled that the original request was in 1992 for up to 12 intersections for testing LEDs. Helmer is encouraged by the dialogue he heard concerning the Caltrans LED Study and by local agencies moving to LEDs around the nation. He sees the technology improving and the price for LEDs dropping. He wishes to expand the City's experiment to collect the kind of empirical data that many agencies need and to assist manufacturers. Helmer was impressed about the capability to operate LED signals in a power off situation in a flash red sequence. He favors including this aspect in the San Jose experiment.

Jim Helmer said the City was continuing to monitor accidents, power usage savings, and cost of maintenance. They are conducting surveys of motorists and pedestrians. The City of San Jose has approximately 700 intersections. The request is for testing an additional 300 intersections. The reason for another test is that the technology is changing. The manufacturers are making better equipment now than they did in 1992. Support for testing came from the City's legal staff and from the CTCDC. Helmer feels it is important to continue the experimentation process. He envisions including both AlGaAs and AlInGaP technology in the experiment. The City would consider testing gel cells as a backup for power failure. Helmer said the City intends to borrow the Caltrans device for measuring degradation.

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92-4B L. E. D. STUDY, CITY OF SAN JOSE (continued.)

Jim Helmer said it is difficult to determine, at this time, whether LEDs, which do not meet the spec that ITE is developing, would be replaced upon ITEs publication of their recommendations. There are too many unanswered questions, such as the perception of the viewer, to consider. Gary Foxen expressed his concern over dim incandescent traffic signals now in use. He hoped that the LEDs would be an improvement. He wouldn't want to see the some problem develop with LEDs.

Bruce Carter noted that there seems to be a lot of local agencies that are using LEDs without having asked for permission from the CTCDC. He asked if the Committee could create an umbrella permission to experiment for these other agencies. Chairman Folkers suggested the motion could be worded "Caltrans, counties and cities." John Wallo noted that Caltrans and the City of San Jose had followed the established procedure and appeared before the Committee. There are cities that have taken off on their own, with the encouragement of the industry and installed LEDs. He disagrees with blanketing other agencies. Wallo feels we have no idea of what is being tested, what kind of maintenance will be provided, or any other aspect of the experiment. He also wondered if a blanket approval really provides local agencies any protection. Chairman Folkers responded that Committee approval might help local agencies with litigation problems.

Bruce Crater suggested a stipulation that agencies using LEDs meet the requirements now in development. Chairman Folkers pointed out that the Committee does not know what agencies are using LEDs on their own. He would like to see some means of identifying those agencies and pointed out that it wouldn't be until mid-1996 that an ITE standard will be available and that will only apply to a red indication. Wayne Tanda recalled that the Secretary sent a letter to cities, counties, and others, explaining the situation, and providing the opportunity for agencies to contact the CTCDC for permission to experiment.

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92-4B L. E. D. STUDY, CITY OF SAN JOSE (continued.)

Wayne Tanda said the LED Subcommittee of the Traffic Engineering Council for ITE should have a set of interim purchase specifications, for red LEDs, early next year. These specifications would be in use for about three years, pending the comprehensive NCHRP report. Tanda hopes the data being collected by Caltrans, the City of San Jose, and other jurisdictions, will go into the NCHRP study. He advocates the CTCDC being part of the process. Tanda believes the local agencies using these devices can use the ITE specifications when they come out next year. Unfortunately those who do not meet those upcoming specifications may have a problem. Tanda believes that the new generation of LEDs will meet the ITE specification.

Wayne Tanda, referring to Hank Mohle's letter to John Wallo, asked the question of why is it necessary to seek approval to use LEDs in California. The CTCDC evidenced its belief by granting a number of agencies permission to experiment with LEDs. Tanda said the Traffic Manual doesn't specify detailed requirements for LEDs. The City of San Jose turned to the Traffic Signal Specifications for the State of California which, under Illumination, makes reference to ITE specifications. [Signals Lighting and Electrical Systems (Section 86-4) requires a clear traffic signal lamp be used.] The ITE specifications are for incandescent light bulbs. Technically there are no LED specifications. Tanda believes the ITE Joint Committee will put in a preface in the existing ITE specifications that says if you're going to use LEDs refer to the new purchase specifications. These new specifications will be very specific to LEDs. Tanda said that the technology being sold by the manufacturers will absolutely meet the new brightness standard in the upcoming ITE purchase specification.

Wayne Tanda explained that ITE learned from its experience of having industry reject earlier specifications. There needs to be a cooperative effort and that is why ITE is using both industry and consumer committees. Dick Folkers observed that if the Committee makes such a decision, then local agencies complying with the interim ITE specification need not request for permission to experiment. Tanda agreed. Tanda brought up the possibility that because of the review process, any ITE specification could be delayed and that is why the City of San Jose thought it necessary to seek permission to experiment. He hoped that there would be no significant delay.

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92-4B L. E. D. STUDY, CITY OF SAN JOSE (continued.)

Jack Kletzman cautioned against pinning hopes on a future specification which has not been seen, nor approved by Caltrans. ITE adoption is not the same as Caltrans adoption. He agreed with Tanda that the correct procedure continues to be to go through the CTCDC.

Hank Mohle said the stakes in using LEDs are very big, because cities are desperately trying to save money. He urged the development of guidelines and thanked the Committee for its efforts.

Don Follett said he was sensitive to the burden placed on local agencies trying to improve traffic safety in their jurisdictions and yet may be doing something that is not quite proper. Follett hoped there was some means to alleviate the necessity for a full and complete study proposal without violating the guidelines. He asked the Secretary if the minutes could reflect the Committees support of local agencies using LEDs in an effort to improve public safety. Jack Kletzman told the Committee that Section 21400 says the Department of Transportation is responsible for adopting rules and regulations prescribing uniform standards and specifications for all official traffic control devices. The Department must consult with local agencies and the public and it is for this purpose that the CTCDC was formed. Chapter 11 of the Traffic Manual was specifically adopted by the Department. Section 11-01.4 contains guidelines for the authorization to experiment and they preclude a blanket authorization. Kletzman said he did not have the qualification to advise anyone on legal matters, but it would be his interpretation that, since this section was adopted, it carries the legal force of the CVC.

Bruce Carter doesn't consider the LED a new traffic control device. He considers the LED as the internal workings of a traffic control device. Chairman Folkers said the LED could be considered a step up from the incandescent bulb. Jack Kletzman said the problem with LEDs was that no standard has yet been established. This is not just a California problem, it's a national problem. Chairman Folkers after reading Section 11-01.4 concluded that there was no way the Committee could grant a blanket approval. He suggested that the best approach was to have any agency wishing to test LEDs, formally request permission to experiment from the Committee.

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92-4B L. E. D. STUDY, CITY OF SAN JOSE (continued.)

Frank Girardot established that the Committee's action with respect to other communities wishing to join Santa Rosa's crosswalk experiment, was consistent with communities wishing to test LED signals. In both cases, request for permission to experiment must be granted by the Committee based on the local agency's application.

MOTION: By Jack Kletzman, second by Merry Banks, that the city of San Jose be allowed to expand the LED experiment by a maximum of 300 intersections.
Motion carried 8-0.

ACTION: Item tabled pending further experimental results. [This item will now contain a 92-4C L.E.D. Study, by Other Local Agencies.]

92-18 GOLF CART SYMBOL SIGNS

Chairman Folkers told the Committee that the consultant's report had not been submitted to the City of Palm Desert, but he was hopeful that a package would be available for the Committee at the next regular meeting. Wayne Tanda noticed that a circular, published by the Federal Department of Transportation, requested comments on proposed changes to the MUTCD. One of the items [Docket No. 95-8 Item 10.] was the golf cart symbol sign.

ACTION: Item continued.

93-2 L.E.D. STUDY, CALTRANS

Jack Kletzman reviewed for the audience that Caltrans was conducting an LED study in the Fresno area (District 6.) An interim report, which had been given to the Committee, was published in the agenda for general circulation. The LEDs continue to be monitored, but the study has not progressed to the point where an additional interim report is appropriate. Kletzman said that a test was conducted to simulate degradation, so that the perception of degradation could be made tangible. He then introduced Les Kubel who is the Caltrans Chief of the Office of Electrical Systems.

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93-2 L.E.D. STUDY, CALTRANS (continued.)

Les Kubel said that he wanted to know what kind of visual impact was exhibited when there was degradation. He said that industry considers 50% degradation to be the life of an LED. Kubel had light output measured as the voltage was decreased to simulate degradation. An incandescent lamp was compared with two LEDs at 120 volts (ITE initial light distribution specification), at 100 volts (28% degradation), at 90 volts (44% degradation), and at 80 volts (55% degradation.) The incandescent lamp was kept constant at 120 volts. On a subjective basis, the 55% degradation looked acceptable.

Les Kubel wants to repeat this test on a more scientific basis. He realizes that a lot of people are anxious, as is Caltrans, to proceed with some standard. He feels additional experimentation is needed to be able to answer the questions of when an LED has failed and how to determine whether an LED has failed. He also noted that improved LED technology has already resolved many of the problems that had previously surfaced.

Harold Garfield who is a member of ITE's Traffic Signal Subcommittee said, the National Committee was not doing anything with regard to experimentation. He said the new MUTCD will allow use of LED signal heads. It will not have a standard but will refer to the ITE standard. An ITE committee is developing a standard for all signal indications regardless of the light source.

Chairman Folkers said that many communities would like to know how soon will devices be approved so that degradation will not be a problem? Les Kubal explained that Caltrans was not yet in a position to adopt a standard, there simply is not enough information. Kubal noted that LED degradation is sensitive to humidity and heat. John Wallo mentioned that NCHRP has issued a research digest, regarding LEDs, which contains recommendations, guidelines, and suggested research.

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93-2 L.E.D. STUDY, CALTRANS (continued.)

Jerry McElroy said that Caltrans District 6 installed LEDs to save power consumption. He said that they have had better results from burnout with LEDs than with incandescent bulbs. Dimming is subjective. He pointed out that an LEDs intersection, in a power out situation, has the capability to be put on red flash, for 12 hours, with one dry cell battery. McElroy believes this capacity favors the use of LEDs. It is the answer for how to safely handle power outages at intersections. He said that his lowest rating, measured with the new FHWA equipment was 33% degradation in three years. McElroy passed out charts comparing Watts to Candela Output for various manufacturers and percent signal lamp burnouts per District. He said LEDs are a new device, not just another light bulb.

Clyde Sweet said he started installing LEDs in 1991 in the City of Fontana because senior citizens were getting rear ended by trucks. The problem was caused when elderly drivers would slam on their brakes when they viewed an incandescent arrow and an adjacent light with aberrant peripheral vision. He believes the LED substitution worked because the skid marks all disappeared. The City did not consider LEDs to be a new traffic control device, just a new light bulb. They discovered degradation very quickly. The initial installation was 600 mcd lamps, with clear lenses, which passed the ITE test except for three points. Looking into the sun, they found 30% degradation unacceptable. The lamps were refit with 2000 mcd units, which tripled the light output and extended the immediate degradation to approximately eighteen months. Sweet's maximum record is 2¹/₂ years. He measures brightness and voltage on red signals in the field, and then adjusts the readings with an incandescent and a new LED in the office. Sweet said that Fresno has LED intersections that operate on 99 volts without anyone noticing a perceptible difference. He is working with the local power company to raise the voltage to 117 volts.

Clyde Sweet said he had neither the time or the money to fill out the paperwork to request permission to experiment on what he considers a maintenance item. He recommended the Committee follow the ITE specification and consider these devices a maintenance item. He is concerned both, about potential liability, and the increased cost of power over the next 20 years if LEDs were not in use. [Mr. Sweet has subsequently filed for, and has been granted, permission to experiment by the CTCDC.]

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93-2 L.E.D. STUDY, CALTRANS (continued.)

Wayne Tanda said he had no problem with Caltrans continuing the study. Gary Foxen said he was concerned about how motorists react to power outages. He is convinced that many motorists are not familiar with the law that says to treat a dark intersection as an all way stop. The value of battery driven LEDs to put the intersection on flash is an important consideration. Foxen is also concerned that in the absence of an ITE guideline, the definition of minimum light output allows LEDs to be sold which do not meet the needs of the motorist. He also feels a more precise definition of LED life is needed to determine the economic benefit of converting to LEDs. Chairman Folkers said that the rapid evolution of LED technology has already increased the life of the device.

John Tosky said that the basic question is the necessary light output to function. If a signal at 50% is acceptable, then it is acceptable regardless of the lamp technology, and anything brighter is also acceptable. David Evans said ITE had two groups, one representing industry manufacturers and the other representing users such as traffic engineers. Meetings were held in Fort Lauderdale and Denver. Evans anticipates a preliminary document, available for review, will be announced in the November ITE Journal . Comments will be requested by January. A consultant will be hired by ITE to complete an interim specification for red LED signals, with place holders in the document for amber and green, by February.

David Evans understands that a scientific determination of the minimum light output, necessary for traffic signals to enable a motorist to respond appropriately under various driving conditions, and for various ages, has never been established. A proposal has been placed before NCHRP to answer this question by 1998. Based on this information, it can then be determined what the light output should be for a new signal, using either incandescent or LED sources, and when the indication is no longer operational.

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93-2 L.E.D. STUDY, CALTRANS (continued.)

David Evans gets information from lamp manufacturers that tell him high wattage lamps can degrade as much as 50% in 1500 to 3000 hours before burnout. There are lamps in the market that are guaranteed for much less than this. Evans believes there are traffic signals that should not be out there. In addition, the housing needs to be painted. Different States paint the housing different colors. The human eye has a threshold that detects a 1.6 to 1 difference. Most light illuminated signs that you see have a 2 to 1 difference across a pixel range. There is no information on AlGaAs red LED traffic signal degradation. It is being developed. Information from Hewlett Packard studies correlates with the information being developed by Caltrans District 6, which indicates that after eighteen months there is a 25-30% degradation which then stabilizes. Evans said his data is not yet confirmed, but it seems to project a 50% degradation past 6 years with AlGaAs technology. The second generation AlInGaP technology is projected to last 11 years with an average degradation of 25%. These TS AlInGaP LEDs should be in production by the summer of 1996 for amber, red, and yellow-green.

David Evans said that in January, 1993 the average price of an LED traffic signal was \$300. A contract was let in the State of Oregon, a few months ago, and the price was \$200. Price erosion happens very fast for LED traffic signals. The payback is no longer 3 years and 4 months, it is more like 2 years or less. At the ITE Committee meeting the expectation of 10 years seems to be shrinking to 6 years because the payback has gone to 2 years. We are now looking at Carson City, Nevada that is trying a first generation AlGaAs 622 and may try AlInGaP for the whole city. The City of Anaheim is currently putting up AlGaAs. There are other cities in the nation that are looking at both technologies. One of the Scandinavian countries is looking at LEDs. We are seeing a doubling of LED traffic signal installations per year. We are being pushed by the cost of power and safety. One traffic engineer from the State of California told Evans that he was putting up red LED traffic signals because he would not have a red out no matter what happens. If he loses a string of LEDs, the signal is still there. Chairman Folkers expressed his appreciation for the information provided by David Evans and said local agencies would like to see the reliability, availability, and price reductions that Evans envisioned as soon as possible.

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93-2 L.E.D. STUDY, CALTRANS (continued.)

Clyde Sweet told the Committee there were two marketing techniques, a manufacturer can sell some units at a high price, or he could sell many units at a lower price. In this case, one could have a large output LED, using less current, with a longer life, or one could use a lower output LED, with a higher current, with a shorter life. This is an oversimplification. Sweet estimates the 2000 mcd rated LEDs, that are currently in use, will give a life of 7 to 10 years, and still meet satisfactory standards. The City started out with 600 mcd rated LEDs, with a red faceted lens, which did not work. The economic return is currently calculated at 3 1/2 years. The 7 year life allows Sweet to avoid the labor expense of an annual bulb change. He has 15 signals that use Durotest bulbs, with a minimum of 400 cubic inch optical cavity. At the end of 28 months of operation he has zero burnouts. There were 14 older signals using 300 cubic inch cavity which had to be changed at the end of 2 years. These signals burn hotter, in a smaller space, and he had 1 burnout.

David Evans said that the Hewlett-Packard study was not proprietary and he would supply the Committee with any information. He said there was a lot of information from around the United States. The City of Philadelphia has an urban energy consortium which is currently running tests on a number of brands of LED traffic signals. The goal is to see how they perform and come up with a specification. Evans said he tried to encourage Caltrans to join the consortium. They have 125 signals going to their third summer. He believes the City of Winsor, Ontario is 100% LED.

David Evans acknowledged that the development of LED technology has not been without setbacks, but the product is improving. Hewlett-Packard is envisioning an LED warrantee to its customers. What the customer does with the LED, will determine what warrantee the signal light manufacturer can give to Caltrans. Evans understands that the signal manufacturer's envision a warrantee for the signal light for 5 years. Les Kubal pointed out that the concern was for safety and replacing fixtures will not prevent an accident. Kubal asked about indemnity instead of warrantee. Evans responded that in the City of St. Paul if you have one signal per corner at a fourway intersection, and one of those signals goes out, you have a bad situation. You will not have that with LEDs.

ACTION: Item tabled pending further experimental results.

93-4 CONVEX MIRRORS

Chairman Folkers told the Committee that past action by the Committee simultaneously closed out the item and established a subcommittee. He questioned the wisdom of continuing subcommittee work on a closed issue. Bruce Carter recalled that the Committee held that convex mirrors were not a traffic control device. Nevertheless these mirrors are a tool, the most common use being to alert drivers exiting from parking structures that pedestrians are approaching the driveway. The question is "Should there be some recommended guidelines?" Carter had been contacted by several agencies that wanted to employ convex mirrors but were concerned about possible liability from using an unregulated tool. Folkers recalled that there had been concerns over the possibility of amplified light reflection, but because the mirror is convex the light source appears smaller.

Gary Foxen said that he noticed convex mirrors being used along Mulholland Drive, in southern California, where visibility from driveways was impaired. Foxen also recalled the Committee discussed using convex mirrors to alert motorists of a train behind them at left turn light rail crossings. He suggested an issue statement by the Committee would be of help to local agencies because of the traffic ramifications of mirrors. Foxen agreed to replace Carter as the subcommittee chairman.

ACTION: Item continued.

93-10 SIGNING, LIME-YELLOW SPECTRUM

Bruce Carter explained that the Committee had approved several applications for experimentation with lime-yellow signing in conjunction with the FHWA nationwide test. Carter said that the City and County of Napa concluded that the visible behavior of drivers was not affected by the new signing, there was an increased awareness of the driving situation, and the sample was too small to draw any significant conclusions. The City of Los Angeles concluded that the signs were too green and suggested that the FHWA consider a fluorescent sign that is more yellow and more closely resembles the standard color scheme of existing traffic control devices. The City also recommended that the product not become required for crossing signs until this color is made available as a non-proprietary product.

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93-10 SIGNING, LIME-YELLOW SPECTRUM (continued.)

John Wallo hoped that the testing in this program considered atmospheric conditions such as rain and fog. Wallo cited a letter to the editor of Roads and Bridges which recalled that several years ago, fire equipment started using a lime green yellow. They have subsequently moved away from that color because of poor visibility.

Bruce Carter noted that California needs to be in substantial compliance with the National Committee and they will review many more experiments than the three agencies submitting experimental results to the Committee. He concluded that the CTCDC should wait for the results of the National Committee's test program. Chairman Folkers established that the result submitted to the CTCDC were also submitted to the FHWA.

MOTION: By Jack Kletzman, second by Bruce Carter, to table the item until recommendations are published by the MUTCD. Motion carried 8-0.

ACTION: Item tabled.

93-18 CROSSWALKS, SEQUENTIAL LIGHTING

Chief Rosano, of Santa Rosa, recalled for the Committee that a significant number of auto-pedestrian accidents caused the City of Santa Rosa to seek an innovative solution to reduce accidents. One of the ideas that surfaced was to illuminate the crosswalk. An experiment to determine if such a device would be effective in reducing accidents, was proposed by the City, and approved by the Committee.

Chief Rosano said that three locations were selected for testing and an independent consultant was hired to evaluate test results. This was in addition to the City's engineering staff evaluation. The test results and the evaluations were forwarded to the Committee.

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93-18 CROSSWALKS, SEQUENTIAL LIGHTING (continued.)

After the devices were installed there was a measurable increase in the drivers awareness of pedestrians in the crosswalk based on an analysis of braking time at two of the locations. Two of the locations were retrofitted as a consequence of improvements recommended by the consultant. Chief Rosano said that the brightness of the devices was enhanced and the number of devices along the crosswalk were increased. He said that at least one of the installations has been operating for approximately six months without any visible sign of degradation. Chief Rosano thanked David Evans for his assistance with the project.

Chief Rosano requested that the Committee recommend approval of the use of these devices at least in concept, that Caltrans then evaluate what standards should be adopted, and that the City of Santa Rosa be allowed to continue to evaluate the devices.

Gary Foxen established that the multi-lane roads were better suited to the device than two lane roads because leading automobiles obscure some of the devices. Two of the three test locations are four lane roadways. The problem that instigated this experiment occurred on four lane roadways. Commonly, one car stopped for pedestrian traffic, and a second car, in the next lane, assumed the first car was making a turning movement, and was unaware any pedestrians. On two lane roadways, the limited number of devices originally installed may have contributed to the obscurity problem. Four more devices have been added to the two-lane roadway and this installation will be re-evaluated. Foxen attributed the observed improved motorist responses to the fact that the device was in operation only when activity in the crosswalk occurred. He asked if the crosswalk device was superior to an overhead flashing light, for alerting motorists, because its location on the pavement better identified the pedestrians path. Chief Rosano said that the test locations had the capacity to evaluate a flashing overhead light acting in concert with the flashing pavement markers.

Chief Rosano noted that the preliminary study evaluated speed and braking distance because any accident evaluation will require a much longer duration. He said that although there may be some additional fine tuning, most of the recommended changes have been incorporated into the device. Future testing will evaluate the devices as they exist.

93-18 CROSSWALKS, SEQUENTIAL LIGHTING (continued.)

Jack Kletzman feels the submitted recommendations are premature. Any policy on how to use the device should be based on experimental results. The test process needs to be continued over a longer duration to evaluate improvements already made, and to insure the novelty of the device isn't the primary attraction to motorist's attention. Kletzman favors authorizing the City to continue testing, but feels that the device has not been developed to the point where a recommendation can be submitted to Caltrans. Other studies seem to indicate that anything done for the pedestrian increases his false sense of security and no safety improvement has yet been demonstrated to counterbalance this. Kletzman said he has seen the device in operation and has high hopes for its success. He recommended the Committee only move on the third recommendation.

Chief Rosano suggested allowing other cities to participate in the experiment. He noted that Santa Rosa has limited resources and that additional experimentation could provide answers for an expanded number of conditions. Other cities interested in testing had contacted the Chief and are waiting to find out what action the Committee would take. The consensus of the Committee favored allowing other agencies to join the experiment.

Bruce Carter would like to see some economic evaluation of this system in comparison to the cost of an ordinary pedestrian signal. Carter thought the proposed device was a stand alone system but heard in the presentation that the installation included a pedestrian signal. Chief Rosano said the devices currently operate as a stand alone item. There is one location which has a overhead flashing yellow light. The City is considering using the flashing light in concert with the device as opposed to having the flashing light on continuously. Basically the device was intended for use where no other controls existed. Chief Rosano also said that because the device is in a developmental stage there were no valid cost figures. Obviously the prototype cost is high and would drop appreciably in a production mode. Carter voiced concern over the specifications.

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93-18 CROSSWALKS, SEQUENTIAL LIGHTING (continued.)

Dick Folkers recommended considering the recommendations individually. Merry Banks asked how much data and what time frame would be needed for the Committee's satisfaction. Jack Kletzman said that at present there were only three locations being tested one of which was unsatisfactory and there had been numerous upgrades so that the device now in the field had very little data. Also there was no data that support improved safety. This is not unexpected because, fortunately, auto-pedestrian accidents don't occur in a short period of time with such frequency as to provide a representative statistical data base. Banks asked if two years of testing by the City of Santa Rosa and additional testing by other agencies would be sufficient. Kletzman responded that he believed that amount of testing could be a basis for evaluating the device.

Harold Barkley, a member of the audience, objected to the lack of uniformity. He noted that the City of Los Angeles uses a flashing red at there mid-block cross walk as opposed to the flashing yellow. He said that Caltrans uses red reflective pavement markers to warn motorists that they are entering an exit ramp. He recommended using red instead of yellow to tell the motorist to stop. Chief Rosano responded that this option had been considered and rejected because the flashing red would have been a regulatory device. Amber or yellow was selected to warn the driver of the possibility of a pedestrian in the crosswalk.

John Wallo established that there were no recommended warrants at this time and concurred with Kletzman's suggestion to only move on the third recommendation of the report. Chief Rosano said the engineering firm did recommend warrants, but those warrants were limited to the crosswalks evaluated, and that may not be sufficiently universal for Caltrans. Wayne Tanda congratulated the City on producing such a thorough report. He expressed concern about observations made in the memoranda that if left unanswered could cause problems with continued operations of the device.

MOTION: By Bruce Carter, second by John Wallo, that the city of Santa Rosa continue the existing experiment and that other cities, with the approval of the CTCDC, be allowed to join in the experiment. Motion carried 8-0.

ACTION: Item tabled pending test results.

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94-1 BICYCLE SIGNAL TIMING

Jack Kletzman reviewed that the California Bicycle Advisory Committee had recommended guidelines for bicycle signal operations, using language taken from the MUTCD, for inclusion in the Traffic Manual . *"Bicycles generally can cross intersections under the same signal timing arrangement as motor vehicles. Where bicycle use is expected, extremely short change intervals should not be used and an all red clearance interval may be necessary."* Caltrans Traffic Operations is opposed to this because it interferes with signal operations. This does not preclude those agencies who wish to, from using the MUTCD guidelines. Gary Foxen asked that the item be held over so that Alan Wachtel could be present.

Rick Blunden said he could not speak for Alan Wachtel, who was not present. Blunden suggested that the item be continued. Wayne Tanda asked why Wachtel couldn't attend the meeting or make his position on this issue known. Blunden responded that Wachtel did make his position known to the Committee in previous meetings and it was the Caltrans Traffic Operations that are unwilling to include this language in the Traffic Manual. Because of this opposition Blunden proposed to delete the item.

Rick Blunden recalled that Alan Wachtel who was the Chairman of the CBAC Subcommittee that developed language that was too specific for Caltrans Traffic Operations. Blunden said he was asked to develop language that was less specific and came up with the current MUTCD language.

Gary Foxen said he was unsure of the reason for Caltrans objecting to the MUTCD language. Bicyclists can be put in a tenuous position because traffic engineers don't keep the bicyclist in mind when making timing measurements. He believes that bicycle safety could be improved if such language were included in the Traffic Manual. Jack Kletzman pointed out that the local agency, if it wanted to, could use this and merely reference the MUTCD.

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94-1 BICYCLE SIGNAL TIMING (continued.)

Wayne Tanda said the function of the Committee, as representatives of different agencies, was to advise Caltrans, and then let Caltrans make the decision. Don Follett felt the may condition provided sufficient flexibility for local agencies.

MOTION: By Wayne Tanda, second by John Wallo, that Caltrans include the language proposed by the CBAC, which is consistent with existing MUTCD guidelines, in the Traffic Manual. Motion carried 7-1.

ACTION: Item completed.

94-3 STOP SIGNS AT MID BLOCK

Gary Foxen recalled that 1993 legislation allowed the erection of mid-block stop signs by local jurisdictions. A subcommittee was formed which developed guidelines, ultimately rejected by the Committee. Jack Kletzman called Foxen and recommended reconsideration of the effort. Kletzman said that initial Caltrans opposition to the guidelines was based on a misunderstanding which has been corrected. Caltrans now understands that the law has been enacted and that guidelines are needed to promote uniformity and to minimize excesses. Kletzman rewrote the guidelines as follows:

- *STOP signs may be installed between intersections, on a local highway, in accordance with CVC Sections 21360 and 22450(b) for the purpose of enhancing traffic safety.*
- *Mid-block STOP signs should not be used for speed control.*
- *Mid-block STOP signs shall not be installed within 175 feet of an intersection.*
- *Mid-block STOP sign shall not be installed unless an accident record demonstrates a traffic safety problem defined as 5 or more accidents between intersections, within a 12 month period, capable of correction, and involving injury or greater than \$500 property damage.*
- *Care must be taken to ensure that visibility of the STOP signs is unimpaired.*
- *Mid-block STOP signs shall not be used on State Highways.*
- *Potential impact on pedestrians shall be evaluated.*

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94-3 STOP SIGNS AT MID BLOCK (continued.)

Jack Kletzman believes that most traffic engineers were not in favor of mid-block stop signs, least of all Caltrans. The problem is, and the Committee recognized this, that they are now legal and guidelines should be established for uniform application. Clyde Sweet favored the guidelines and recommended "Mid-block STOP signs *shall* not be used for speed control." He also recommended that installations be increased from 175 feet to 300 feet and advocated normally precluding STOP signs from arterial roadways. Kletzman explained that he called the City of Sacramento and found the smaller side of blocks were 400 feet, divided in half gives 200 feet, and allowing 25 feet for flexibility, resulted in the 175 feet. Chairman Folkers said that criteria was acceptable as far as he was concerned.

Gary Foxen envisioned a shopping center driveway, which is not really an intersection, on an arterial which carries a lot of traffic, might be an application for using STOP signs on an arterial roadway. Bruce Carter advocated new legislation to rescind the law. Chairman Folkers said the best way to initiate legislative action was through the parent organizations.

John Wallo wanted a clarification of whether the CVC exempted Caltrans from mid-block STOP signs. Jack Kletzman read Section 22450(b) "...a local authority...at any location on a highway under its jurisdiction..." Caltrans is not a local authority.

Wayne Tanda preferred the original draft because of verbiage indicating conditions where mid-block STOP signs were inappropriate. Chairman Folkers suggested using the original preamble and then citing the newly proposed criteria. Tanda suggested that Gary Foxen and Jack Kletzman form a sub-committee to work out a combination format. Gary Foxen felt the requirement for five collisions at one location might be too high. Foxen preferred some other rationale. Chairman Folkers agreed citing the erection of a new development might warrant such an installation prior to that many accidents. Wayne Tanda liked the warrants for a multi-way STOP sign. The consensus of the Committee was to form the sub-committee and continue the item.

ACTION: Item continued.

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94-8 RADAR ENFORCED SIGN

Gary Foxen told the Committee that the County of San Diego contacted him about an inadvertent omission that has occurred with regard to the RADAR ENFORCED (R48-1) sign plate which had been recommended for adoption by the Committee. The current policy for the plate allows use with R2 speed limit signs but does not include 55 MPH MAXIMUM SPEED LIMIT (R6) signs. Foxen does not think it was the Committee's intention to overlook use of an R48-1 plate with R6 signs. The County is requesting such usage.

Don Follett said that the California Highway Patrol, in general, does not enforce 55 MPH with radar. There is a test being conducted on Route 15 to see if freeway radar is feasible. John Wallo observed that the proposed recommendation would only apply to local roads.

MOTION: By Bruce Carter, second by Jack Kletzman, to recommend that the policy for the RADAR ENFORCED (R48-1) sign plate be revised to include usage with 55 MPH MAXIMUM SPEED LIMIT (R6) signs. Motion carried 8-0.

ACTION: Item completed.

94-9 SIGNAL PHASE SIGN (R54)

Jack Kletzman recalled that the ____-WAY SIGNAL (R54) sign is intended to warn motorists that they may not get the green light when they expect it. The need for caution can be caused by a high speed movement, hidden from view, and an over eager motorist. It is a "may" condition and there is no requirement to use the sign. Kletzman said the Committee requested a revised policy which was now being presented to the Committee.

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94-9 SIGNAL PHASE SIGN (R54) (continued.)

Chairman Folkers subscribed to the idea of using the proposal. John Wallo doesn't see a need for the sign. Chairman Folkers reiterated the fact that if you don't need it, you don't use it. Jack Kletzman said it was used by Sacramento, San Francisco, Los Angeles, and other communities. Gary Foxen said that the initiating letter suggested that the sign was used without rhyme or reason for its use. The writer suggested either the sign be dropped or the policy clarified. Foxen supported this. Kletzman said the policy had been revised.

Gary Foxen read *"May be used at a signalized intersection where the signal indications provide more than two distinct traffic movements and where the traffic movement may not be readily apparent to the motorist."* Foxen mentioned an eight phase traffic signal with left turn indications. Chairman Folkers said that there are indications that are readily apparent to the motorist and the signs and markings complement that. So it wouldn't be at an eight phase signalized intersection. There are instances of split phase signals which people don't understand.

John Wallo clarified the new policy has nothing to do with the phases, the need is where the motorist is unaware of the movement. Chairman Folkers pointed out that the whole idea is to provide a tool for the designer to lessen confusion and reduce accidents. Gary Foxen said that without a clearer articulation of the policy local agencies might be challenged because they have not used this sign at a location that meets the policy criteria and they chose not to use the sign because they don't feel it is necessary. Chairman Folkers reiterated that it is a may condition. There is no requirement to use the sign. Foxen believes it can be challenge by a court because of what an agency could have done and didn't. Chairman Folkers responded that is where engineering judgment comes into being. Bruce Carter thinks an agency is in trouble trying to defend a may condition.

Chairman Folkers described that in Palm Desert the phase is split. Motorists tend to get confused in their expectations. Even with a green arrow and opposing traffic stopped, motorist hesitate to move. This sign seems to make it easier for the motorists. John Wallo wanted clarification of which approaches were to be signed. Chairman Folkers said he would sign those legs which were affected.

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94-9 SIGNAL PHASE SIGN (R54) (continued.)

Wayne Tanda told the Committee that the genesis of the issue came from Harry Parker who couldn't figure out what the old verbiage meant. He also thought that motorists were confused when they saw the sign. Jack Kletzman agreed that the sign verbiage might not be technically understood, but the message is clear. Motorists recognize that something unusual is going to happen. The awareness that something is different is enough to keep him out of the intersection.

John Wallo established that the signal in Palm Desert is a four phase on the major street and a split phase on the side streets, which go separately. Chairman Folkers uses the sign for the direction which has unique phasing which, in this instance, is the side streets. Both Wayne Tanda and John Wallo requested that Harry Parker be invited to the next meeting. Gary Foxen suggested also notifying Wes Pringle.

MOTION: By Bruce Carter, second by Jack Kletzman, to adopt the new policy..
Motion passed 4-3. (Not a sufficient plurality to adopt a change in policy.)

ACTION: Item continued.

95-4 BIKE LANE SYMBOL PAVEMENT MARKING

Rick Blunden explained that the Traffic Manual says that the word message BIKE LANE and the arrow are to be used on the pavement. A bike lane symbol may be used to supplement the word message. The symbol cannot be used in place of the word message. This policy was developed in about 1976 and adopted in the Traffic Manual in 1978 or 1979. In August of 1994, when this issue came up again, the CBAC recommended not to change the current policy and that the word message is necessary in the bike lane. The bike lane symbol, by itself, is not enough to provide a strong message. There is no mistake in the Traffic Manual. The Committee, and others, have expressed the view that using both the word message and the symbol is expensive, redundant, and requires extra maintenance.

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95-4 BIKE LANE SYMBOL PAVEMENT MARKING (continued.)

Rick Blunden said that the MUTCD allows the use of a diamond symbol, a bicycle symbol, a word message, and an arrow. The handbook for the MUTCD specifies that the BIKE LANE word message and the arrow must be used. The other symbols are optional extras. California is not in favor of using the diamond symbol, but otherwise, we are consistent with the MUTCD since 1983. There is a strong feeling by CBAC that the word message is still necessary. There has been no test or survey taken.

Rick Blunden said the word message was an attempt to indicate the specific nature of the facility as opposed to a bike path or bike route. Blunden said that bike lane, bike path, and bike route were defined in the Highway Design Manual and in law. A bike path is a separate paved area, separated from the roadway, with no other vehicles allowed. A bike lane is signed, striped, has pavement markings, and is part of the highway. A bike route is only a signed route without pavement markings. He said Section 11202 of the CVC specifically uses the term bike lane and might account for the use of the message instead of the symbol. Section 21206 has several sections identifying bike lanes and the associated traffic operations by bicyclists and motorists, and the authority local agencies have in establishing bike lanes on roadways.

Bob Brow observed that if the wording were removed from the pavement it should also be removed from the signs in order to be consistent. The bike coordinator chose not to use arrows on bike lanes, and as a result the California Highway Patrol refused to cite violators because the facilities were not valid bike lanes. The County now has about 157 miles of bike lanes which need arrows added.

MOTION: By Bruce Carter, second by Don Follett, not to change the existing markings and to delete the item. Motion carried 8-0.

ACTION: Item deleted.

95-8 HOV GUIDELINES, SIGNING AND MARKING (Ch. 5)

Jack Kletzman explained that Committee members had been a sent rough draft of the Signing and Marking chapter of the proposed Caltrans' HOV Guidelines for their review and comments.

Chairman Folkers asked if "...the diamond symbol is used only to designate HOV facilities." on page 5-2, third paragraph, was compatible with the MUTCD provisions. Phil Jang responded that the diamond symbol in the MUTCD denotes preferential lanes. Caltrans uses it only for HOV lanes. Another deviation was the color of stripes for buffers. California uses yellow instead of white stripes for the buffer lane, even though the HOV traffic and the general traffic are going in the same direction. Jang said the yellow denotes warning and is consistent with yellow signs.

Jack Kletzman told the Committee that the interim sign designations such as CP-1 will be changed to conventional sign numbers used in Caltrans standards. John Wallo suggested signs in the HOV Guideline details be placed facing in the direction motorist s would view them. Wayne Tanda suggested on page CP-3, note 1 be changed to metric. Tanda noted that most informational signs are horizontal rather than vertical and some of these signs were vertical. Jang responded that these signs were designed this way because of inadequate room. Tanda noted that there were some warning signs which were rectangular rather than the standard diamond shape. Chairman Folkers concluded that deviations from standard signing was necessitated by severely restricted available room in the median. Normally designed signs would be hit by vehicles or their mirrors.

Robert Peterson said an additional reason for using rectangular warning signs was because the standard requires a diamond symbol at the top of HOV lane signs. Wayne Tanda agreed that pragmatic considerations should be the deciding factor in the design of HOV signs. Only other traffic engineers would relate sign shape with the category of sign. Tanda observed that Detail M-9 indicated that all HOV lane lines were to be in thermoplastic. Phil Jang said that was true except for temporary striping. Peterson said thermoplastic was preferred because of maintenance. Tanda asked if the standard could be clarified because, although thermoplastic is the standard for Caltrans, it was not being required for local agencies.

95-8 HOV GUIDELINES, SIGNING AND MARKING (Ch. 5) (continued.)

Gary Foxen suggested the use of an overhead cantilevered sign, at the beginning of all HOV facilities, and that the sign be illuminated if the facility accommodates HOV traffic during the hours of darkness. The details show this. Phil Jang explained that there were differences between northern and southern California. The details show such a sign for buffered lanes like those existing in Southern California, but for the contiguous lanes such as those in the Bay Area it is not required. Foxen thinks they should be required because he feels the signs on the median barrier are too small to give adequate notice.

Robert Peterson said the initial proposal was consistent. Northern California opposed it because the contiguous lanes allow entrance and exit along the entire length of the lane. An overhead sign at the beginning of the facility would be ineffective. Foxen feels the overhead signs should be placed periodically, and where the lanes are buffered, the overhead signs should be at each entrance and exit. Peterson said they were. Jang said the issue is still open and this overhead sign for contiguous lanes would be considered.

Phil Jang explained that a directive for establishing HOV facilities is under development and is expected shortly. Robert Peterson said the Federal ISTEA required that HOV lanes should be considered whenever capacity was being added to Federally funded highways. Foxen feels that part time car pool lanes are confusing to the motoring public. He cited a case in Los Angeles where a shoulder was used as an HOV lane during peak traffic hours and then reverted it back to a shoulder during off peak. That didn't work at all. Jang responded that there are other considerations involved including political concerns and the needs of the local agencies. In the Sacramento area, the only car pool lane is on Route 99. It was set up for full time HOV operation, primarily because of SACOG and air quality concerns. During the off-peak there is insufficient usage to justify a car pool lane from a traffic operations perspective. Jang feels congestion in the Bay Area is somewhere between Los Angeles and Sacramento. The hours of operation of an HOV facility is driven by congestion and the needs of local agencies.

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95-8 HOV GUIDELINES, SIGNING AND MARKING (Ch. 5) (continued.)

Gary Foxen suggested the usage of DO NOT CROSS STRIPES signs, with a \$270 minimum fine, which used to be used in Los Angeles. Phil Jang said such signs were considered but there is simply not enough room to erect such signs. Jang said there are signs which say the fine is \$270 for violating HOV lane restrictions. Before 1993, violations were typically 8%. After the implementation of the sign, violations dropped to 3% and have tended to stay there. Foxen agreed that such signs were helpful in keeping motorists with insufficient passengers out of the HOV lanes. He remains concerned that motorists fail to understand that if they cross the stripe to enter or exit a lane the fine is still \$270. Jang pointed out that doing so is a moving violation. Jang said that Caltrans felt it was sufficient to place two solid yellow stripes at locations too narrow for two sets of double yellow lanes which most motorists recognize as a barrier. Foxen said his organization would try to educate its membership.

Gary Foxen said he liked the CP3 sign which lets the motorist know what ramps are served by the exit lane. Phil Jang said there were signs for multiple ramps served by an exit. Robert Peterson said that one of the problems is having sufficient room for multiple destinations on one sign. In order to make room normal designations such as avenues, boulevards, and other verbiage were being eliminated. Where warranted advanced warning signs will be used. Jang noted that the committee which developed the draft guidelines included a member from the California Highway Patrol. The task force which developed the original guidelines in 1991 included a member from the of the Automobile Association.

Gary Foxen said that the diagram notes showed a CAR POOL ONLY message and a diamond symbol are to be placed in the car pool lane and the message is allowed to be worn away. Foxen would like both the message and the symbol maintained. Phil Jang responded that the policy was formulated to reduce maintenance and there were sufficient signs to provide the information. Bruce Carter warned to expect a lot of calls when the public noticed the message not being maintained.

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95-8 HOV GUIDELINES, SIGNING AND MARKING (Ch. 5) (continued.)

Gary Foxen requested that Detail M-11 show diamond symbols in the left turn lanes that lead to HOV facility. He also wanted a typical detail of a cat track marking that would lead the car pool driver to the correct side of the entry. Robert Peterson said that Detail M-11 originally was a Signing and Marking detail with a lot more markings on the diagram. It was recommended that Detail M-11 be for signing only so that consultants would not assume these were the only markings required for the Detail. Markings will be shown on a separate schematic.

The issue of standards for approaches to HOV lanes was brought up, but that responsibility belongs to another unit . [Office of Traffic Operational Systems.]

MOTION: By Jack Kletzman, second by Bruce Carter, to recommend approval of the draft, with consideration for the comments made by the Committee.

Motion carried 8-0.

ACTION: Item completed.

95-9 LEFT TURN LANE PROTECTIVE/PERMISSIVE SIGN

Jack Kletzman told the Committee that he got a letter from the City of Lake Elsinore. They apologized for not being able to attend the meeting and wished to submit additional information on their proposed experiment. Chairman Folkers commented that at the ITE meeting in Denver there were several configurations of a similar sign.

ACTION: Item continued.

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95-10 WARNING SIGNS W73 & W73A

Jack Kletzman said Mr. Mysore Satish, of Alhambra, suggested that it was improper to have regulatory verbiage on warning signs. Caltrans agrees and intends to change W73 from RIGHT LANE MUST EXIT to RIGHT LANE EXIT ONLY and W73A from RIGHT LANE MUST TURN RIGHT to RIGHT LANE TURNS RIGHT. There is no change in policy.

After several questions about existing policy, Chairman Folkers read the following from the Traffic Manual: "RIGHT (LEFT) LANE MUST EXIT SIGN. The RIGHT (LEFT) LANE MUST EXIT sign (W73) shall be placed between the THRU TRAFFIC MERGE LEFT sign (W74) and the RIGHT (LEFT) LANE MUST EXIT sign (R18A) at locations where overhead EXIT ONLY signs (W61) are not in place for lane drops at freeway exit ramps.

Dave Royer said the City of Los Angeles uses the W73 wherever they have lane drop striping and they like the fact that the warning sign uses the same language as the regulatory sign. Bruce Carter concurred. An unidentified member of the audience said they found they were giving a mixed message to the motorist. The word MUST implies they must remain in that lane and they must exit, once they pass the sign. On the other hand the skip stripe tells the motorist they can change lanes. The regulatory sign is placed opposite a solid stripe which cannot be crossed. We are currently using the same sign verbiage with two meanings. The proposed verbiage change would clarify that crossing the skip stripe is permitted.

Alex Kennedy said the warning sign is not enforceable. He doesn't believe we would want to use enforceable language on a non-enforceable sign. It is probably not advantageous to have the motorist confused by the word message on the sign versus the skip stripe on the road. Bruce Carter doubted that the general public is that aware of the meanings of regulatory versus warning language. Kennedy told the Committee that the change was not made on the basis of an individual letter, but that Caltrans had received a number of complaints.

MOTION: By Jack Kletzman, second by Don Follett for recommending approval of the proposed W73 and W73A revisions. Motion carried 7-0 with 1 abstention.

ACTION: Item completed.

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95-11 DIAMOND LANE, WARNING SIGNS

Jack Kletzman told the Committee that Caltrans perceives a problem with motorists getting trapped in the HOV lane. Motorists who err into the HOV lane are prevented from exiting by other drivers who block their return. The three signs submitted to the Committee are an attempt to direct the non-car pool driver into the proper lane. In addition to the symbol signs, there is a supplemental plate which describes the number of people required for entry and hours of operation of the diamond lane. These are warning signs, not regulatory signs, so that the motorist is aware of the upcoming lane configuration ahead of time. Kletzman said the proposed signs were circulated in a number of committees at Caltrans, including the HOV office, and were endorsed.

John Wallo established that these signs would not be used at the entrance of an HOV facility. At that point the signs might as well be regulatory. The signs are intended for use downstream of the HOV facility to prepare the driver to select the proper lane. Chairman Folkers suggested that these signs would be placed on a major arterial so that motorists don't end up in the wrong lane. Wallo clarified that motorists could, if they wanted to, turn into the diamond lane. He does not feel the sign is a clear message and suggested such signs should be shown to non-engineers for interpretation.

Wayne Tanda agreed that the sign was unclear. Jack Kletzman said the sign was intended to show motorists where to go if they don't want to go into the diamond lane. Bruce Carter feels the signs don't give that message. They say here is where to go. John Wallo agreed saying the sign does not convey the message of having an option of going into the diamond lane. Chairman Folkers established that Caltrans no longer described the number of people required to use the diamond lane by use of a number in the diamond symbol. Alex Kennedy said Caltrans now describes the hours of operation and the number of people required to use the HOV lane by means of a supplemental plate. These signs are regulatory and enforceable.

95-11 DIAMOND LANE, WARNING SIGNS (continued.)

Alex Kennedy said there were numerous complaints of people getting trapped in HOV lanes. The fine is expensive, its approximately \$300 for a first time offender. Gary Foxen congratulated Caltrans for trying to resolve the problem. He agrees it is necessary to advise the motorist of the correct lane. ACSC had also gotten a number of complaints. Foxen prefers the supplemental plate to say CARPOOL LANE AHEAD. He is concerned that the symbol signs be clearly understood by the motorist. Alex Kennedy explained that Canada had success with these signs. Their system is more sophisticated than ours and these signs are used on their surface streets. Kennedy agreed with the Committee, that if engineers don't understand the symbol sign then it would be unlikely for the public to understand the sign. In the Caltrans review there was some concern about what the arrow was showing. Kennedy said Caltrans was looking for the Committee's assistance in determining how the arrow should be laid out and how the sign should be used. Perhaps the sign can be erected at locations with a high number of violations.

John Wallo established that it was inadvisable to stripe all the motorists over to one lane and then let them select the normal or HOV lane. Alex Kennedy felt that such markings would reduce the capacity. Bruce Carter suggested the use of a supplemental plate instead of an arrow to explain which lane to use. If the motorist qualifies for the HOV lane, it can be used, otherwise the motorist must move to the appropriate lane. The symbol signs identify the correct lane.

ACTION: Item continued.

95-12 SYMBOL SIGNS, TRUCK ENTERING ROAD & FALLING ROCKS

Jack Kletzman explained that there might be some application, here in California, for a few symbol signs proposed for international use under NAFTA. The signs originated from Canada, the United States, and Mexico and were being reviewed by Caltrans. The first sign, was a symbol sign for trucks entering or crossing a road with an educational plate defining the movement. A second sign warns motorists to watch for rocks and has an optional educational plate.

95-12 SYMBOL SIGNS, TRUCK ENTERING ROAD & FALLING ROCKS (continued.)

Bruce Carter said he was driving through Idaho where "watch for rocks" symbol signs were posted extensively. Carter felt the signs were explicit. John Wallo suggested using two signs, one depicting a truck crossing and a separate sign to indicate trucks entering the highway. Wallo said he felt there is a need for such signs but wants to differentiate between crossing and entrance. Jack Kletzman said the supplemental plate differentiated between crossing or entrance. He explained two diagrams were used to show the dimensions of either the plate or the sign.

Bruce Carter noted that all signs are assumed reversible and suggested that two signs showing a truck on either side of the road was unnecessary. Alex Kennedy said ultimately this sign could replace the truck crossing sign. The MUTCD has no such similar sign. Chairman Folkers suggested the use of a human factors specialist to evaluate the signs. Kennedy said we had no such expert on staff. John Wallo recommended ITS at Berkeley. Wayne Tanda wanted to see how this proposed sign relates to other kinds of crossing signs such as cross traffic ahead or fire vehicle access. He recommended following the same type of symbol outline. Tanda was bothered by the fact that the truck was shown in profile and the road was in the plan view. The consensus of the Committee was to have the truck signs brought back.

MOTION: By Bruce Carter, second by John Wallo for recommending approval of the proposed watch for rocks symbol sign. Motion carried 8-0.

ACTION: Item continued. [Truck sign portion.]

95-13 HIGHWAY MARKERS, CALTRANS EXPERIMENT WITH SAFETY STRAND

Jack Kletzman told the Committee that motorists have problems in snow areas. Raised pavement markers cannot be put down because of damage caused by snow plows. With a minor quantity of snow all pavement markings are obliterated. Experimentation with the Safety Strand device is an attempt to provide some delineation for the motorists in snow areas.

95-13 HIGHWAY MARKERS, CALTRANS EXPERIMENT
WITH SAFETY STRAND (continued.)

Bruce Crater said his company was trying to develop a device that would be visible with snow on the ground and yet be tolerable. [The device is a hard rubber or plastic cone base, about 1 1/2" high, anchoring a group of fluorescent pink plastic strands, about 6" high.] Crater showed a full size model and said the strands were very flexible. The size of the strand was selected so that it could not be easily removed by the snow plow. The device is recessed into the pavement and only the plastic strands exist above the road's surface. With use, the strands gray, which makes them more visible.

Bruce Crater acknowledged that the color of the strands does not comply with accepted highway standards. He proposed adoption of a new program for roadways which were subject to hazardous driving conditions. Hazardous driving conditions would be defined as those conditions causing impaired visibility and more difficult navigation. Snow, fog, and excessive rain, are common causes. In the proposed program, present delineation remains unchanged, but those roads designated as hazardous, would use additional devices of contrasting colors to provide improved visibility. Crater said the hope was to bring safety to the highways where markers are precluded because of snow plows or because any appreciable storm will bury them. Even where markers are recessed, any significant snow storm will render them useless.

Bruce Carter supported testing the device and asked if it were possible to manufacture the standard yellow. Bruce Crater responded that the strands could be any color desired, but the pink strands were selected because it gives the highest contrast possible. Carter was concerned that some areas have a short snowfall period, but the devices exists for the entire year, and he would therefor prefer a standard yellow color. Crater responded that at night the yellow color doesn't contrast as much and tends to fade into the snow. Jack Kletzman said that one of the test results should be an examination of the trade off between the standard yellow versus the improved visibility pink. Kletzman said there was also some question of the type of fiber to be used. The proposed test might examine a number of fibers to determine which would best withstand the snow plows.

Bruce Crater said the devices were installed in a variety of ways depending on the roadway surface. In previously cured AC or concrete, holes are drilled. On fresh AC, which is still soft, the device is punched in.

95-13 HIGHWAY MARKERS, CALTRANS EXPERIMENT
WITH SAFETY STRAND (continued.)

John Wallo established that the developer was a private company and Caltrans is testing the product. The company would install the devices and Caltrans will evaluate the product. Alex Kennedy explained that Caltrans has a Traffic Devices New Products Committee which evaluates new products and will examine this device. Wallo is concerned that, if motorists have better delineation, it may encourage them to go too fast for the road conditions, and increase the number of accidents. Kennedy agreed accidents were important. Without a centerline motorists could drive off the road. Caltrans maintenance personnel are always having to pull motorists out of ditches. Wallo responded that this could be speed related. Kennedy said without experimenting, we can't tell.

Gary Foxen was concerned about the use of fluorescent pink. He recalled that in the development of the MUTCD there were judgments made in determining that yellow should be the standard centerline color. Foxen said some thought white to be more visible than yellow. Nevertheless, yellow was still selected because it was thought important to use a different color to signify a line separating opposing flows of traffic. He is bothered by the Committee even considering using anything but yellow for the centerline.

Gary Foxen is also concerned about using the device as a lane line. He noted that the Committee is discussing a full time application and not just when snow is present. He cautioned that motorists might not realize these devices are flexible and might or might not take evasive action because of reacting incorrectly to the device. Bruce Carter concurred in rejecting the fluorescent pink color. Carter said the National Committee is considering reversing itself and recommending white centerlines based on an Australian study. He doubts it will happen.

John Wallo raised the possibility that such a color might be in conflict with the Vehicle Code. Bruce Carter offered to revise the motion because of all the reasons offered by the Committee. Bruce Crater said that white couldn't be used for lane lines because of the snow, so some other color would have to be used to mark the lane. He said the same concern about drivers reaction occurred when Bott's dots were first put out on the road. The worst thing that will happen, should drivers fear running over the devices, is that the drivers will remain in their lane, which is what is wanted.

95-13 HIGHWAY MARKERS, CALTRANS EXPERIMENT

WITH SAFETY STRAND (continued.)

Bruce Crater believes driver tendency will be to keep further from his device than from a lane line. Crater feels that the non-standard color will attract the drivers attention to the yellow line and emphasize the yellow line. John Wallo established that large signs would be placed at the test areas to inform the public. Jack Kletzman said Caltrans isn't advocating using the fluorescent pink, just wishing to look at it. Chairman Folkers suggested using black which would show up against snow and not cause a conflict. Crater felt that black doesn't have sufficient contrast when there is a lack of light - such as in snow, fog, or at night. Another reason for selecting the fluorescent pink was that it was picked up so well by the car's headlights. It is a case of the problem of not using standard colors as opposed to the benefit of superior visibility. The sole purpose of the device is to allow the motorist to see where the road is located regardless of the color of the device.

Gary Foxen established that the device is a supplement to existing markings and that their installation will not interfere with maintaining the stripes. The devices are placed with sufficient spacing and situated outside of the yellow stripe to allow for maintenance. Wayne Tanda established that the devices would not be used for lane lines or edge lines. Only center line. Tanda recommended that the test include the durability for the remainder of the year. He established that the device is in addition to existing markings. Bruce Crater estimated the price at a maximum of \$1.35 installed. He recommended initial testing use the same approximate spacing as reflective pavement markers.

MOTION: By Bruce Carter, second by Jack Kletzman for endorsing Caltrans proposed experiment of the Safety Strand devices. Motion carried 8-0.

ACTION: Item tabled pending experimental results.

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INFORMATION ITEMS

95 - A FOREIGN TRAFFIC CONTROL DEVICES

Chairman Folkers said he intended to show slides taken overseas of symbol signs. He decided to postpone the slide show for when the Committee has a light agenda.

95 - B METRIC CONVERSION

Bruce Carter told the Committee that the FHWA is proceeding with metric conversion but they are having some concern about how, or if, to manage the sign conversion. There was an article in the APWA Reporter where a consultant has published a questionnaire, on behalf of the FHWA, to solicit the opinion of local agencies on metric conversion. Carter and Chairman Folkers urged local agencies to respond to the questionnaire.

Jack Kletzman told the Committee there has been a report issued by the GAO entitled "Conversion to Metric Units Could Be Costly" which is dated July, 1995. The report concludes, *"The Congress designated the metric system as the preferred measurement system in 1988; however, it passed appropriations legislation in 1994 and 1995 that prohibited federal funding of converting highway signs to metric units. As a result, FHWA has postponed requiring states to implement the conversion. The majority of comments on FHWA's conversion options opposed conversion because of the costs."* The report goes on to say, *"Moreover it is unclear who is responsible for metric education and how it will be paid for."*

Jack Kletzman said that there is a proposed amendment on the National Highway System Designation Act of 1996 (S. 440) Sec. 120. Metric Conversion of Traffic Control Signs. *"Section (a) eliminates the requirement that States convert the speed limit, distance, or other measurement using the metric system. Section (b) allows States to request a waiver until September 30, 2000 on the use of the metric system with respect to designing, plans, specifications, estimates, etc. on Federal-aid highway projects."* The status of these amendments is uncertain. Chairman Folkers noted he had reviewed a set of Caltrans I-10 plans which were 100% metric.

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INFORMATION ITEMS

95 - C INCREASED VISIBILITY FOR WORKERS IN CONSTRUCTION ZONES

Jack Kletzman had sent a copy, to Committee members, of a signed Amended Proposed Petition Decision by The Occupational Safety and Health Standards Board. This decision expands the colors which can be used by workers in construction and maintenance work zones. The colors include orange, yellow, strong yellow-green, and fluorescent versions of these colored garments. Alex Kennedy said he expects the Standards Board to give approval once they review Caltrans' Chapter 5.

OFF-AGENDA ITEMS

Jack Kletzman explained that the Cogar Company had demonstrated a sign which lights up without electric current at the Costa Mesa meeting. It was their intent to request permission to experiment under the auspices of the City of Pasadena. Because of changes in personnel and fiscal limitations at the City, that approach is no longer viable. Both the Committee and Caltrans are interested in testing this new sign. The City of San Jose volunteered to test the sign if no other volunteer could be found, but both Wayne Tanda and Jack Kletzman thought it would be more appropriate to conduct the test in southern California which is the location of the manufacturer. Kletzman asked to be notified if any local agency was interested in testing this type of sign.

Jack Kletzman told the Committee that Caltrans had completed the Standard Communications Protocol for Traffic Signals in California as required by AB 3418. No action was required. The Committee had advised Caltrans that they did not wish to participate in the development, but wanted to be kept informed on the matter.

Jack Kletzman thanked Ms. Merry Banks and Mr. Ben Winkler of the California State Automobile Association, and Mr. Doug Mansel of Korve Engineering for the publication of the Light Rail Manual. There were a lot of last minute problems and they did an outstanding job in making the corrections and making the manual available.

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ADJOURNMENT

MOTION: By Jack Kletzman, second by Don Follett for adjournment.

Motion carried 8-0. The meeting was adjourned at 3:35 pm.